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(54) **Skylight**

(57) Skylight for a pitched roof, comprising a first part having an interior placement member to be placed against the inner roof and having a first tube member that allows light to pass through to extend through the roof, as well as a second part having an exterior placement member to be placed against the outer roof and

having a second tube member accommodating the first tube member and extending to the outside, wherein the first tube member is adjustably accommodated in the second tube member.

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Description

[0001] The invention relates to a skylight for pitched roofs.

[0002] It is known to provide pitched roofs with rectangular skylights, having a casing member and a leaf member, which usually is connected to the casing via a window stay. Both parts can be made of synthetic material. In the closed position the leaf will be situated in the roof plane.

[0003] It is an object of the invention to provide a skylight that is easy to assemble.

[0004] It is an object of the invention to provide a skylight that is easy to install.

[0005] It is an object of the invention to provide a skylight having a thermal insulation value that is acceptable to the roof.

[0006] It is an object of the invention to provide a skylight having an effective air sealing.

[0007] It is a further object of the invention to provide a concept for a skylight which renders use in various orientations in a roof surface possible, costing little effort.

[0008] For achieving at least one of these objects the invention provides a skylight for a pitched roof, comprising a first part having an interior placement member to be placed against the inner roof and having a first tube member that allows light to pass through to extend through the roof, as well as a second part having an exterior placement member to be placed against the outer roof and having a second tube member accommodating the first tube member, wherein the first tube member is adjustably accommodated in the second tube member. Assembling the skylight in a pitched roof can easily take place by having both parts extend into each other from the inside and the outside, respectively, wherein the thickness of the roof surface (presence and thickness insulation layer) is of no importance and need not be known beforehand.

[0009] In one embodiment the first tube member extends entirely through the roof, into or past the exterior placement member. The first tube member may be accommodated in the second tube member so as to be freely slidable, so that deformations or changes in the thickness of the roof surface (for instance by adding a layer at the inside) occurring later, can be allowed without changing the skylight.

[0010] If the first tube member extends beyond halfway the second tube member, a double-walled tube structure that may be heat-insulating, is realised over a large length.

[0011] Preferably the second tube member has a tube portion extending in exterior roof direction from the exterior placement member, wherein the first tube member preferably is capable of extending into the said tube portion. The second tube member then extends beyond the (sloping) roof surface and provides guidance to the light from outside.

[0012] Guiding light to the inside is further enhanced when the first tube member at the inner surface is covered with a light-reflecting layer.

[0013] For ease of placement and finishing the interior placement member preferably forms a placement flange that can be provided on the inner boarding.

[0014] The first tube member may have a centre line, which with the placement flange encloses an angle of approximately 90 degrees or an inclined angle of preferably 45 degrees. In case of an inclined angle of 45 degrees a requirement is met for letting the first tube member extend in two directions from the roof surface, particularly horizontally and vertically, as desired when installing. The second tube member may then have a centre line that is at an angle of approximately 45 degrees to the plane of the covering transitional part at the location of the first edge.

[0015] For counteracting cold air flows the first tube member may be provided with a circumferential sealing ring for engagement of the inner surface of the second tube member. The sealing ring preferably is arranged at the outer end of the first tube member to keep cold air out as much as possible. This particularly prevents transport of warm air from interior roof areas to the outside, which in turn prevents condensation at exterior roof elements which in case of frost would result in icing which when thaw sets in might cause leakages. The sealing is at the warm side of the structure, as a result of which internal condensation in the insulation is prevented.

[0016] In a further development of the skylight according to the invention the second tube member tapers, as a result of which small differences of the angle of inclination of the roof surface and the angle between the second tube member and the exterior placement member can be levelled to the eye.

[0017] Preferably the second tube member tapers with respect to the first tube member, so that an intermediate space can be formed which may be heat-insulating. The conicity of the second tube member with respect to the first tube member may be a number of degrees, preferably between approximately 0-10 degrees.

[0018] Insulation is further enhanced when an inner wall is present in the second tube member, said inner wall running parallel to the outer surface of the first tube member. Preferably the second tube member has a hollow circumferential wall that may be filled with heat-insulating material.

[0019] When the circumferential wall extends in interior roof direction to beyond the exterior placement member, particularly forming a tube portion extending to the inside, the heat-insulation at the location of the roof passage is enhanced.

[0020] For allowing light to pass through at least one of the tube members may be provided with one or more plates of transparent or translucent material. The plates may be disposed at the outer end of a tube member, preferably in the second tube member.

[0021] Preferably the plates are transverse, in particular almost perpendicular to the centre line of the tube members, so that a special light effect can be achieved, when the tube members extend horizontally and when the tube members extend vertically.

[0022] Insulation is enhanced when two plates are present which in between them define an air chamber.

[0023] Said chamber may be functionally connected to the cavity formed by the double-walled second tube member, to which end the chamber and the cavity of the hollow circumferential wall are situated substantially adjacent and parallel to each other. Both hollow spaces may be separated from each other by a small partition, yet they ensure a contiguous insulating space around the second tube member.

[0024] In a further development of the skylight according to the invention the exterior placement member forms a plate-shaped covering transitional part in a tile roof. At a first edge the covering transitional part may be provided with a provision for a counter flashing or something like that. Said provision may form a separate part that is attached to the covering transitional part.

[0025] When in an area spaced from the edge opposite the first edge the covering transitional part is aligned with the area contiguous to the first edge with respect to a centre of the covering transitional part, forming the covering transitional part in a mould can easily be achieved by using one single mould for forming a covering transitional part suitable for horizontal positioning of the tube members and a covering transitional part suitable for vertical positioning of the tube members, wherein an insert is placed in the mould contiguous to the first edge or where ever else the area contiguous to the second edge may be formed.

[0026] Preferably the covering transitional part is provided with water guiding and/or sealing strips, such as foam strips, at the side edges.

[0027] Both tube members preferably have a, in cross-section, curved circumferential wall, preferably a circular wall.

[0028] From a further aspect the invention provides a skylight, particularly, yet not exclusively, a skylight as described above, provided with an illumination device having an illumination member, so that the skylight even when there is no natural light (at night) may fulfil a light providing function.

[0029] A special effect and light guidance is achieved when the illumination member is disposed in one of either tube members. The illumination member preferably is disposed in the second tube member, preferably near its end. In case the said plates are present it is preferred that the illumination member is placed near or contiguous to the inner side of the plates. Alternatively an extra plate may be used as light plate.

[0030] Dispersion of light is enhanced when the illumination member is circumferential, preferably following the inner surface, in which case the passage of natural light can remain unobstructed.

[0031] In a particular embodiment the illumination device comprises a LED and a light conductor, as a result of which low-voltage will suffice, which facilitates the connection.

[0032] Preferably the illumination member forms the light conductor, emitting the light. The light yield to the inside is increased when at the outer side of the light conductor a reflector means is placed.

[0033] In one embodiment the illumination member comprises a transparent or translucent plate, of which a main surface, preferably the outer surface, is surface-treated for forming a pattern, wherein the plate edge is provided with a portion through which light, for instance LED-light is radiated into the plate.

The aspects and measures described and/or shown in the application may where possible also be used separately. Said separate aspects, such as the design and the lighting, and other aspects may be the subject of divisional patent applications related thereto.

The invention will be elucidated on the basis of a number of exemplary embodiments shown in the attached drawings, in which:

Figure 1 shows an exemplary embodiment of a skylight according to the invention, in a more or less horizontally oriented position;

Figures 1 A and 1B show a view of a lighting ring in the skylight of figure 1 and a detail thereof according to 1B, respectively;

Figure 2 shows a skylight according to another exemplary embodiment according to the invention, in a more or less vertically oriented position;

Figure 3 shows an outside view of a pitched roof having a skylight according to figure 1 incorporated therein;

Figure 4 shows a pitched roof having a skylight according to figure 2 incorporated therein;

Figure 5 shows a schematic view of the inside of a pitched roof, wherein a number of skylights according to figure 1 have been incorporated;

Figures 6A and 6B show an isometric side view and a top view, respectively, of a skylight having an interior member and an exterior member according to the invention;

Figure 7 shows a cross-section according to the lines VII-VII in figure 6 B;

Figure 8A shows a cross-section of the skylight according to line VIII-VIII in figure 6B;

Figure 8B shows a detail of the sealing at the inside

of the skylight according to figure 8A; and

Figure 9 shows a bottom view of the exterior member of the skylight of figures 6A,B.

[0036] The skylight 1 shown in figure 1 comprises an interior member 2 and an exterior member 3. Both members can be made of synthetic material, for instance by vacuum moulding or injection moulding, in the desired colour(s).

[0037] The interior member 2 comprises a placement flange 4 and a tube member 10 that may be separately made and connected to each other by means of a snap connection 41 that is not further shown. The placement flange 4 has a circumferential edge 7 and a recessed inner portion 8, intended to be oriented towards the roof boarding and having a width varying over the circumference, so that the placement flange 4 is situated eccentrically with respect to the centre line S of the tube member 10. The inner surface 9 of the placement flange 4 has a convex cross-section. Towards the connection 41 the placement flange 4 smoothly changes into a more or less conical collar 6.

[0038] The tube member 10 has a circular cross-section and an inner surface 50 covered with a layer of light-reflecting material. At the end of the tube member 10 a flexible sealing ring 11 is attached, having a sealing lip 11 a extending radially to the outside.

[0039] The exterior member 3 comprises a covering plate 5, intended to be placed against the battens of a pitched roof, parallel to the slope of said roof. At the upper edge shown in figure 1 a notional line 18a is shown, above which a facultative strip 16 is situated, which is formed as one unity with the covering plate 5, and which when forming the covering plate 5 can be left out by filling the mould to be used. Below the line 18a there is a more or less flat plate section 15, onto which elevations or ribs 19 have been arranged for guiding water and for reinforcement.

[0040] In the lower edge area there is a lower edge 18b, which in this case - instead of edge 18a - when being moulded has defined the end edge of the covering plate 5. A flashing 40 is attached around the lower edge 18b by means of a clamping strip 17, which flashing is made of lead or a lead-substituting material, that can be laid over a next tile, for substantially wind and watertight connection thereto.

[0041] Optionally sealing profiles, for instance made of foam, can be placed at the side edges of the covering plate 5 and section 15.

[0042] A tube member 20 is formed as one unity with the covering plate 5, the tube member 20 having a circular cross-section and ending in a flange 30, forming a passage in said end, in which passage plates 31 allowing light to pass through (made of synthetic material or of glass, particularly transparent) have been placed. An outer plate 32 and an inner plate 33 can be distinguished here, which in between them define a heat-in-

ulating -and possibly sound-insulating- air chamber 34.

[0043] At the edges the plate 32 is turned and at that location abuts a ring surface 35 formed in the inside of the tube member 20. For attachment of the turned edge of the plate 32 a layer adhesive medium 36 is applied. At the circumferential edge the inner plate 33 is glued to the circumferential edge of the outer plate 32 turned at that location. The plate 33 can be secured against a shoulder near ring surface 35 by means of an adhesive medium or by clamps.

[0044] As shown in figure 1 the tube member 20 is double-walled, wherein the ring surface 35 via the shoulder connects to an inner wall 23, which continues to beyond the plane of the plate section 15 and defines a hollow chamber 24 with the outer wall 20a,b. At the lower side of figure 1, as considered in the drawing, the outer wall 20b is also continued beyond the connection 38 on the plate section 15, in section 39b, ending in edge 25. At the upper side of the image in figure 1 the outer wall 20a does not extend beyond the connection 27 to the plate section 15, yet runs more or less in the same plane with section 21, in order to run inwards at the location of folding line 22 in section 39a. It will be understood that the sections 39a,b smoothly connect to each other considered along the circumference of the tube member 20.

[0045] The hollow space 24 can be filled with a heat-insulating material and may optionally also provide sound-insulation. The hollow chamber 24 is adjacent to or is functionally contiguous to the chamber 34 defined by the plates 32 and 33, so that no interruptions in the insulation worth mentioning are there.

[0046] In figure 1 it can be seen that the tube member 10 in the direction X slightly tapers with respect to the centre line S, having an angle Y of some degrees, for instance 2.5°. Characterising is that the centre line S of tube member 10 is at an acute angle α to the plane of the placement flange 4, of for instance 45°.

[0047] The inner wall 23 of the tube member 20 has a tapering corresponding to that of tube member 10, wherein the fit is such that sliding in the direction B is simple and sealing takes place by means of lip 11 a.

[0048] The outer wall 20a,b of tube member 20 tapers more than the inner wall 23 does, for instance at an angle β to the centre line S of approximately 5-10°, at an angle δ of approximately 2.5-7.5°.

[0049] At the inner side of the plate 33 a light-emitting ring 37 is placed, which is further shown in figure 1 A and in detail in figure 1B. The ring 37 is made of for instance PMMA, and has an outer edge 37a and an inner edge 37b. The outer edge 37a abuts the inner surface of inner wall 23 of tube member 20. As can be seen in figure 1, the ring 37 has a convex cross-section towards the inside. For attachment the ring 37 is provided with snap lips 47, which are able to snap into snap openings provided for that purpose in the inner wall 23. In figure 1 A only one of the snap lips 47 is shown.

[0050] The ring 37 is provided with an integrally

formed ear 42, further shown in figure 1B. The ear 42 is provided with a hole 43, into which a LED 52 extends. The LED 52 is attached at the location of hole 46 to a schematically shown printed circuit board 44, in which cooling parts have also been accommodated.

[0051] The ear and the printed circuit board 44 work in mounted condition (figure 1) through an opening that is not further shown in the inner wall 23. The chamber 24 can be utilised for the conducting wires for the power supply for the printed circuit board/LED.

[0052] The edges 37a, 37b are sharp, so that no light is diffused there. When activating the LED the ring 37 will conduct and give off light from the ring surface. For increasing the quantity of light given off to the inside, a layer of reflecting material may be provided at the outside of the ring 37.

[0053] The LED may be activated in particular in the period between sunset and sunrise, as a result of which an annular light source 37 is created, of which the light is guided through the tube members 10, 23 to the interior roof space, in order to be used there as light source. Thus a skylight is provided that can be operative both with natural light and with artificial light.

[0054] One of the plates 32, 33, preferably plate 33 can also be used as light plate, having a levelled and polished edge portion against which a LED is placed. The plate can be surface-treated invisibly at the outer surface, for instance printed or grooved, or be provided there with a finishing layer for breaking the LED light in the direction of the inner tube member. This treatment can be given in the form of a pattern or (comic strip/cartoon) figure.

[0055] In figure 2 use is made of the same interior member 2, yet turned 90°, so that tube member 10 is upright, oriented in vertical direction Y. In the same way exterior member 3 is rotated over 180°. The covering transitional part 5, however, has been slightly adapted for that purpose during the moulding process, wherein use was made of a substantially similar mould, yet now the strip 16 is integrally formed at the edge 18b and the edge 18a defines the end edge. On the end edge 18a a flashing 40 is now attached by means of clamping strip 17. One mould thus suffices.

[0056] The flange 30 now forms the upper edge of the tube member 20, with the plate assembly 31 situated within there, which assembly with plate 32 connects to the flange 30 in a water and airtight manner.

[0057] In figure 3 the skylight 1 of figure 1 is incorporated in a pitched roof 60 with tiles 61. The flashing 40 is laid over the lowermost row of tiles 61. The tube members 10, 20 extend horizontally from the roof. Due to the tapering shape of tube member 20 a to the eye horizontal direction is retained, within the usual roof slope range of 35-55°.

[0058] In figure 4 the skylight 1 of figure 2 is shown in pitched roof 60. Due to the tapering shape of the tube member 20 a to the eye vertical alignment of tube member 20 is retained within a variation of roof slopes be-

tween 35-55°.

[0059] The skylight 1 offers an attractive, natural light and artificial light source for residential spaces below pitched roofs, wherein the reflecting layer 50 enhances passage of light.

[0060] Several skylights can be placed attractively adjacent to each other, such as for instance shown in figure 5. This schematically shows a part of a residential space in a pitched roof 60, with roof boarding 62 and panelling 63.

[0061] In an alternative embodiment of the skylight 101 shown in the figures 6A, 6B, 7, 8A, 8B and 9 the interior tube 110 and the exterior tube 20 are perpendicular to the roof surface, which slopes at an angle α .

[0062] The skylight 101 comprises an interior member 102 and an exterior member 103. Both members are made of synthetic material, for instance by vacuum moulding or injection moulding, in the desired colour(s).

[0063] The interior member 102 comprises a placement flange 104 and a circle round inner tube member 110. The placement flange 104 has a circumferential edge 107 and a recessed inner section 108 intended to be oriented towards the roof packet. The placement flange 104 in this example has a width varying over the circumference, so that the placement flange 104 is situated eccentrically with respect to the centre line S of the inner tube member 110. The placement flange 104 may also have a circle round circumference.

[0064] The exterior member 103 forms an outer tube 120 and comprises a two-fold covering plate 105 which is intended to be placed against the battens on a roof packet. The covering plate 105 comprises an inner plate 105a and an outer plate 105b which along the circumferential edge are glued together. From the outer plate 105b an outer wall 120a of an outer tube 120 extends, in the end of which a transparent outer plate 132 has been accommodated. The inner plate 105a on both sides of the outer plate 105b is provided with upright ridges 191 for guiding precipitation along the covering plate 105. In the outer plate 105b an upright 192 is furthermore formed for supporting tiles that can be placed at a slope and in cascade with the covering plate 105.

[0065] Figure 7 shows the skylight 101 built in in a roof packet 200. Laths 201 and transverse thereto parallel battens 202, 203 are attached on the roof packet 200. The covering plate 105 supports on the battens 202, 203, that may optionally at the location of the skylight 101 be mutually displaced for correct abutment to the covering plate 105. The roof packet 200 slopes in the direction of the uppermost batten 202 to the lowermost batten 203. The covering plate 105 at the level of the lowermost batten 203 has an edge for accommodation of a counter flashing between the covering plate 105 and the next tiles. At the side of the inner plate facing the roof packet 200, two projecting placement cams 193 have been formed opposite the edge for the flashing, which cams abut the lowermost batten 203.

[0066] The inner plate 105a comprises a continuation

139b of the outer tube wall 120a, which continuation extends downward and to the inside, and which at an inner end 125 is turned U-shaped towards the inner tube wall 120b, which wall 120b extends to the outside, parallel to the inner tube 110. The outer tube member 120 thus is partially situated in the passage in the roof packet 100. Thus a circumferential chamber 124 is defined by the outer tube walls 120a, b.

[0067] As shown in figure 7 and 8A the skylight 101 has a total of three transparent plates namely, the transparent outer plate 132, a transparent inner plate 133, which are both glued to the outer tube 120 and define a chamber 134. Furthermore an extra light plate 137 is placed at a short distance from the inner plate 133. Around the light plate 137 a rubber attachment ring 138 is situated that supports on the end edge 111 of the inner tube member 110. Between the inner plate 133 and the upper edge 130 of the outer tube member 20 there is a glazing gasket 195 for airtight sealing of the space between the inner plate 133 and the light plate 137.

[0068] The attachment ring 138 around the light plate 137 is shown in more detail in figure 8B. The attachment ring 138 has a supporting edge 140 and opposite it a pressure edge 141 which together confine the light plate 137. Between the supporting edge 140 and the pressure edge 141 a printed circuit board 145 provided with LED lighting is accommodated which is positioned against a levelled and polished section of the outer edge of the light plate 137. Overall three printed circuit boards 31 are accommodated around the light plate 137. The light plate is treated at its outer surface so that it is no longer smooth, for breaking LED light in the direction of the inner tube member 110. The attachment ring 138 is furthermore provided with a circumferential edge 142 extending radially and downward for sealing abutment to the inner surface of the tube wall 120b.

[0069] The light plate 137 is kept clamped in place against the shoulder 121 formed at the end edge of the inner wall 120b, by means of the clamping force provided by circumferential edge 142. The presence of the end edge 11 of the inner tube 110 is not necessary to that end: it can be positioned at a distance (in figure 8A the ultimate entering position of the inner tube 110 is shown). The light plate 137 may optionally be replaced, for which purpose the inner tube 110 may be temporarily removed. For power supply of the printed circuit board 145, wires 146, in the manner shown in figure 7, can be passed through holes 181 and 181, through the chamber 124 and thus through the hole in the roof, to a connection point that is not further shown. When the power is supplied to the printed circuit board 145, the light plate 137 will be illuminated, optionally according to a pattern/figure disposed thereon.

Claims

1. Skylight for a pitched roof, comprising a first part

having an interior placement member to be placed against the inner roof and having a first tube member that allows light to pass through to extend through the roof, as well as a second part having an exterior placement member to be placed against the outer roof and having a second tube member accommodating the first tube member, wherein the first tube member is adjustably accommodated in the second tube member.

2. Skylight according to claim 1, wherein the first tube member is slidably accommodated in the second tube member.
3. Skylight according to claim 1 or 2, wherein the first tube member is capable of extending beyond half-way the second tube member.
4. Skylight according to claim 1, 2 or 3, wherein the second tube member has a tube portion extending in exterior roof direction from the exterior placement member, wherein the first tube member preferably is capable of extending into the said tube portion.
5. Skylight according to any one of the preceding claims, wherein the first tube member at the inner surface is covered with a light-reflecting layer.
6. Skylight according to any one of the preceding claims, wherein the interior placement member forms a placement flange, wherein the first tube member has a centre line, which with the placement flange encloses a right angle or an inclined angle, preferably of approximately 45 degrees.
7. Skylight according to any one of the preceding claims, wherein the first tube member is provided with a circumferential sealing ring for engagement of the inner surface of the second tube member, wherein the sealing ring preferably is arranged at the outer end of the first tube member.
8. Skylight according to any one of the preceding claims, wherein an inner wall is present in the second tube member, said inner wall running parallel to the outer surface of the first tube member.
9. Skylight according to any one of the preceding claims, wherein the second tube member has a hollow circumferential wall, preferably filled with heat insulating material, wherein the circumferential wall preferably extends in interior roof direction to beyond the exterior placement member, particularly forming a tube portion extending to the inside.
10. Skylight according to any one of the preceding claims, wherein at least one of the tube members is provided with one or more plates of transparent

or translucent material, wherein the one or more plates preferably are disposed at the outer end of a tube member, preferably in the second tube member, and preferably are transverse, in particular almost perpendicular to the centre line of the tube members.

11. Skylight according to claim 10, wherein two plates are present which in between them define a chamber.

12. Skylight according to claim 9 and 11, wherein the chamber and the cavity of the hollow circumferential wall are situated substantially adjacent and functionally parallel to each other.

13. Skylight according to any one of the preceding claims, wherein the exterior placement member forms a plate-shaped covering transitional part in a tiled roof, wherein preferably at a first edge the covering transitional part is provided with a provision for a flashing or something like that, wherein said provision preferably forms a separate part, that is attached to the covering transitional part, wherein preferably in an area spaced from the edge opposite the first edge the covering transitional part is aligned with the area contiguous to the first edge with respect to a centre of the covering transitional part, and/or wherein the second tube member preferably has a centre line which is at an angle of approximately 45 degrees to the plane of the covering transitional part at the location of the first edge.

14. Skylight according to claim 13, wherein the covering transitional part is provided with water guiding and/or sealing strips, such as foam strips, at the side edges.

15. Skylight according to any one of the preceding claims, wherein both tube members have a bent, in cross-section, circumferential wall, preferably a circular wall.

16. Skylight according to any one of the preceding claims, further provided with an illumination device having an illumination member, wherein the illumination member preferably is disposed in one of either tube members, preferably the second tube member, preferably near its end.

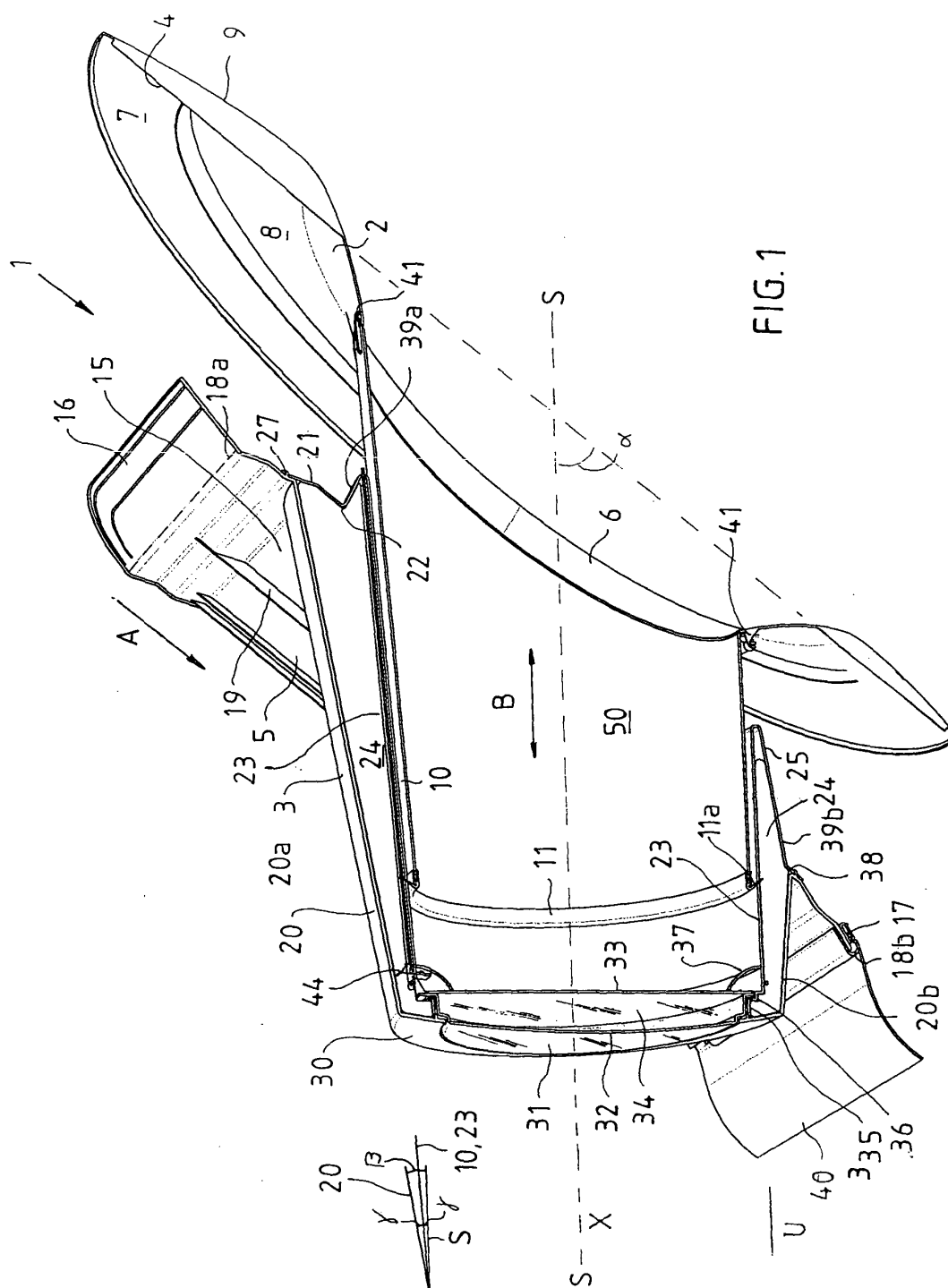
17. Skylight according to claims 10 and 16, wherein the illumination member is placed near or contiguous to the inner side of the plates or at the edge thereof.

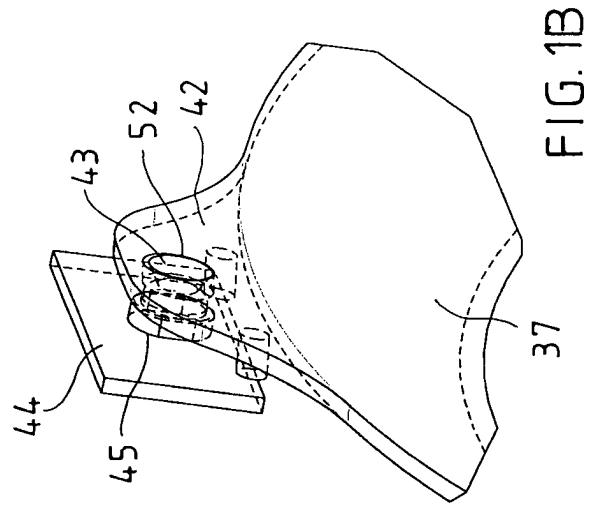
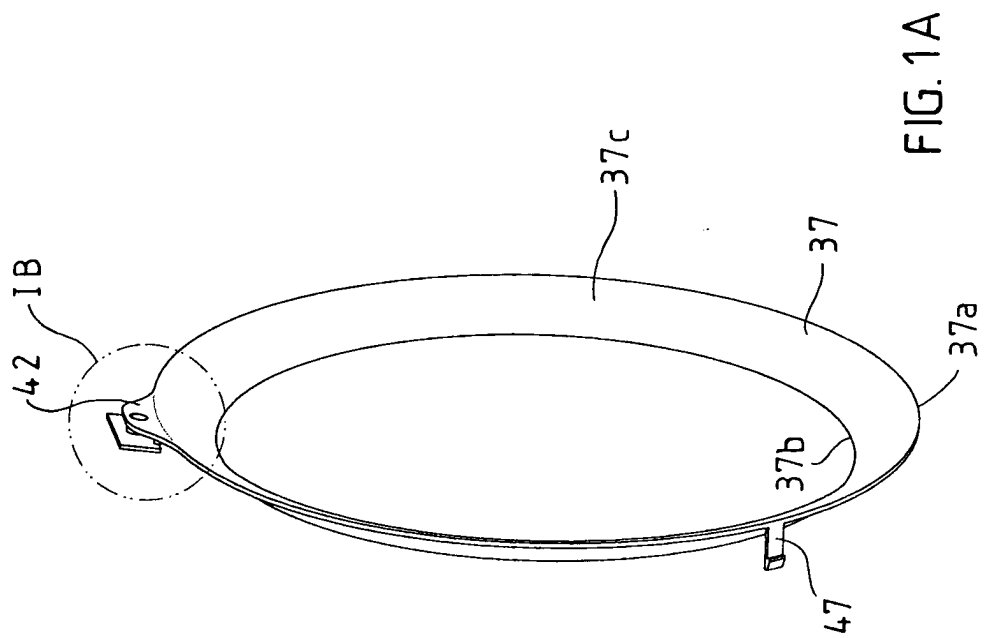
18. Skylight according to claim 16, wherein the illumination member comprises a translucent or transparent plate, of which a main surface, preferably the outer surface, is surface-treated for forming a pat-

tern, wherein the plate edge is provided with a portion through which light, for instance LED light is radiated into the plate.

19. Skylight according to claim 16, 17 or 18, wherein the illumination member is either circumferential in an interrupted way or not, preferably following the inner surface.

20. Skylight according to any one of the claims 16-19, wherein the illumination device comprises a LED and a light conductor, wherein the illumination member may form the light conductor, wherein preferably at the outer side of the light conductor a reflector means can be placed.





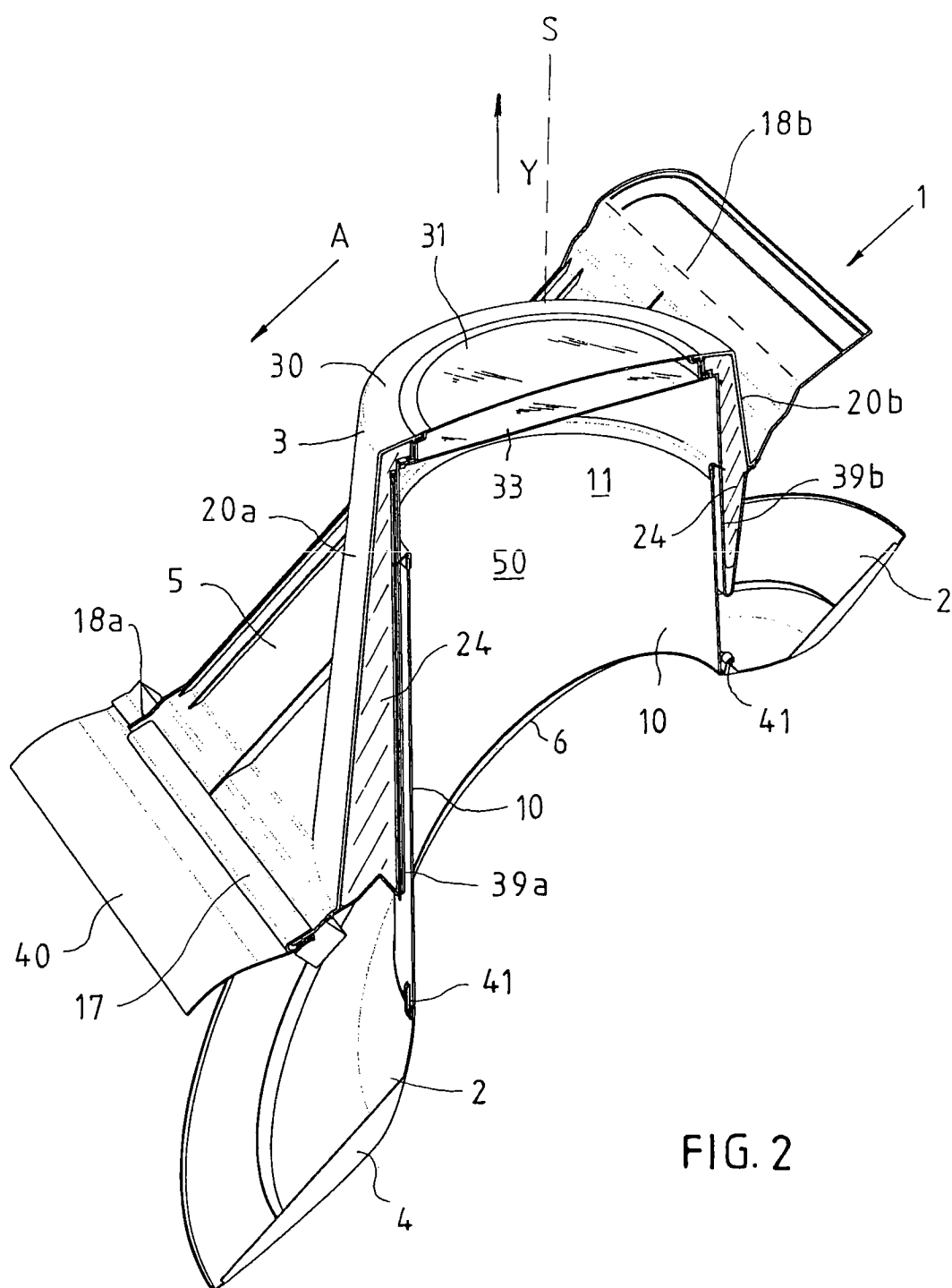
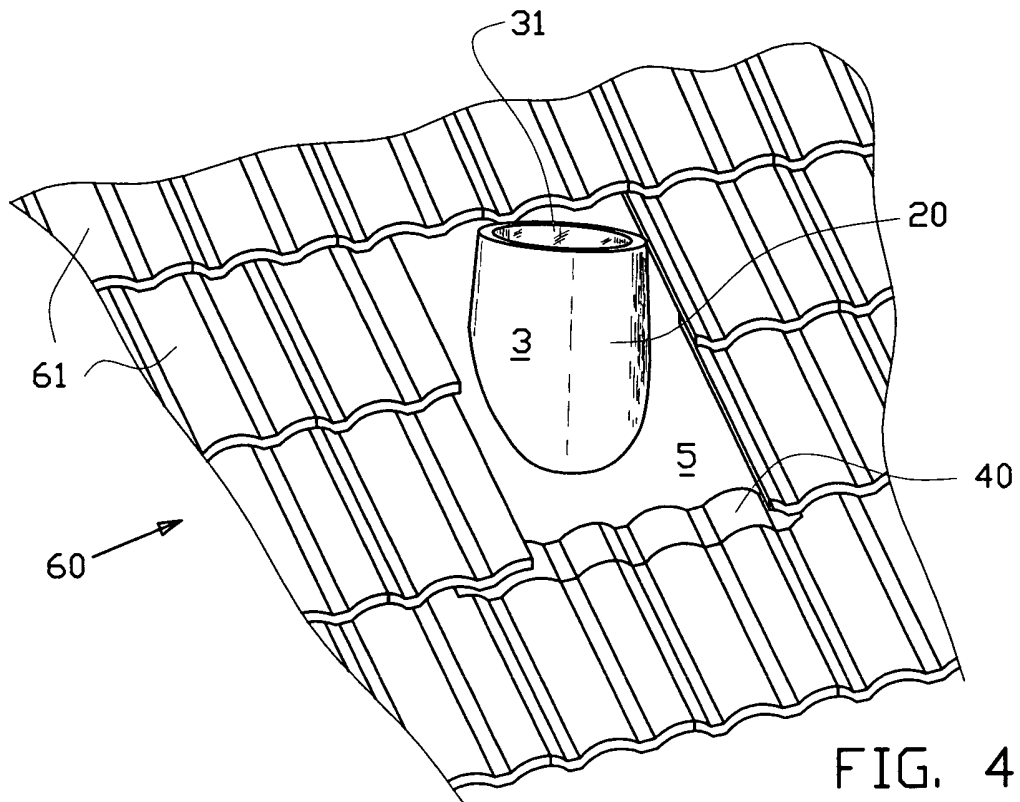
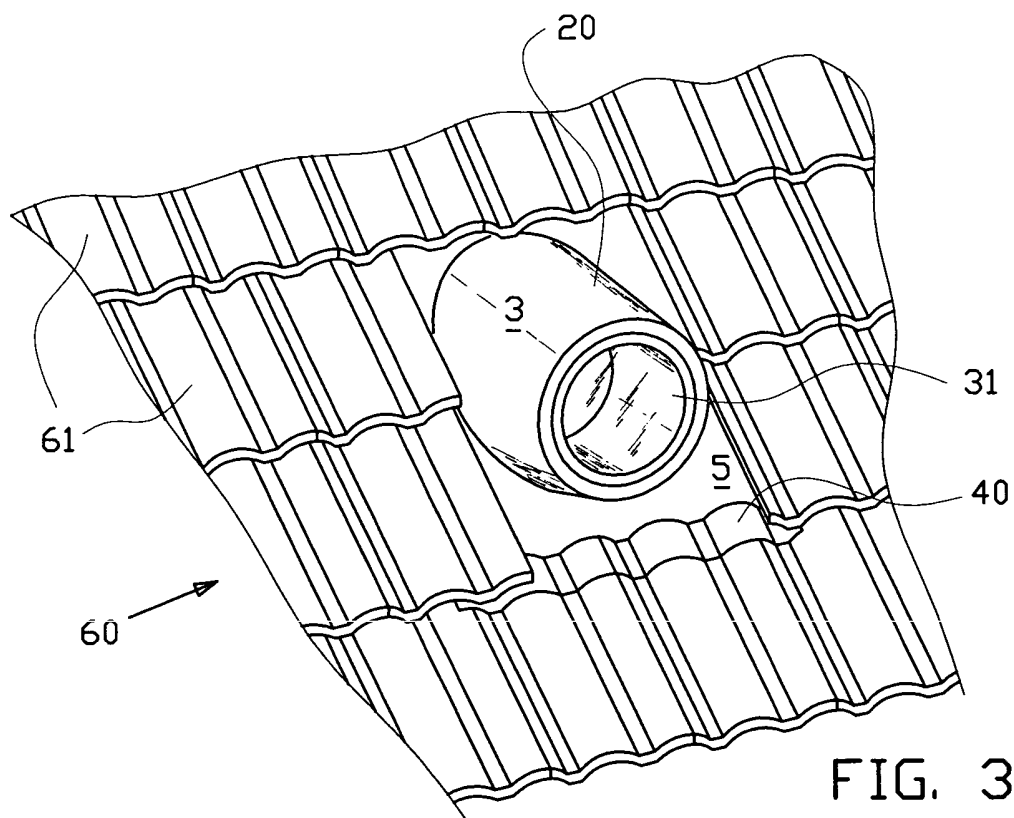


FIG. 2



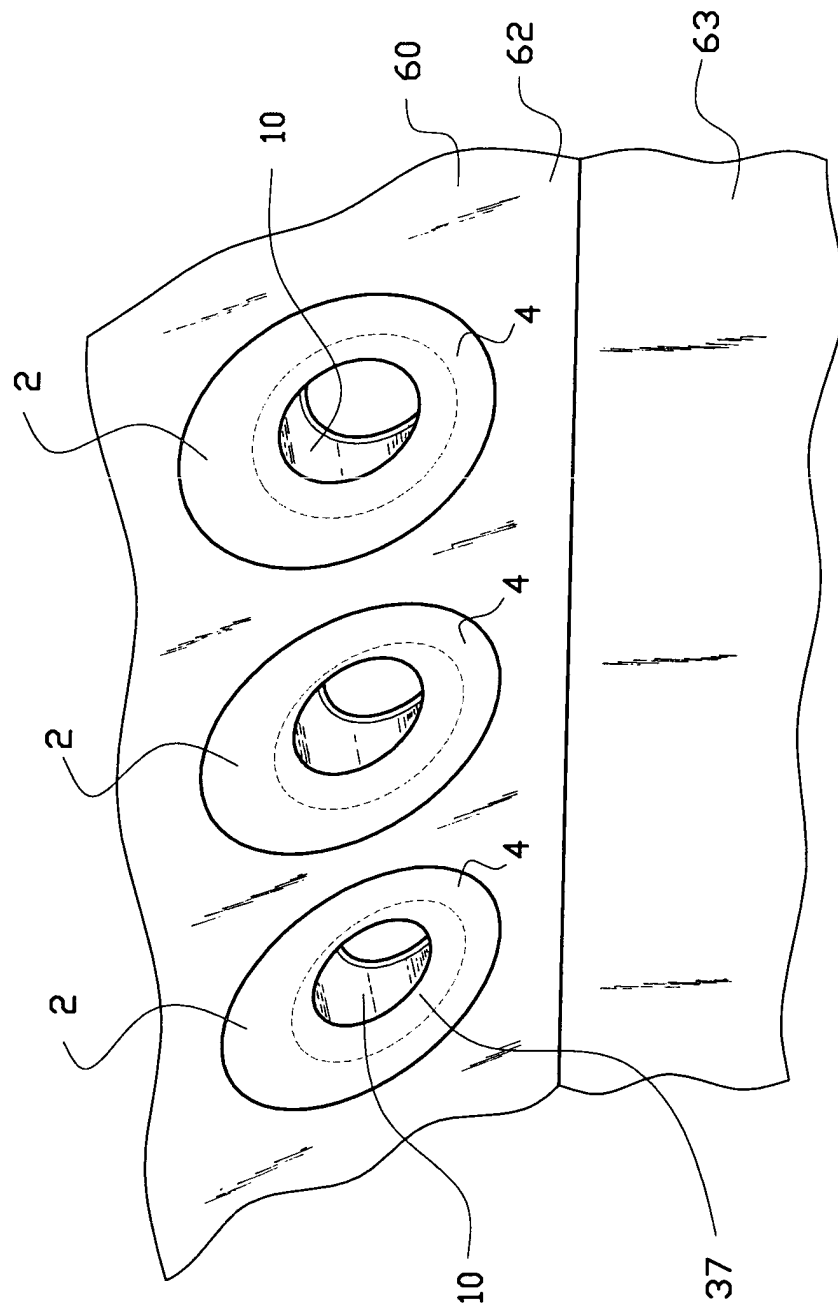


FIG. 5

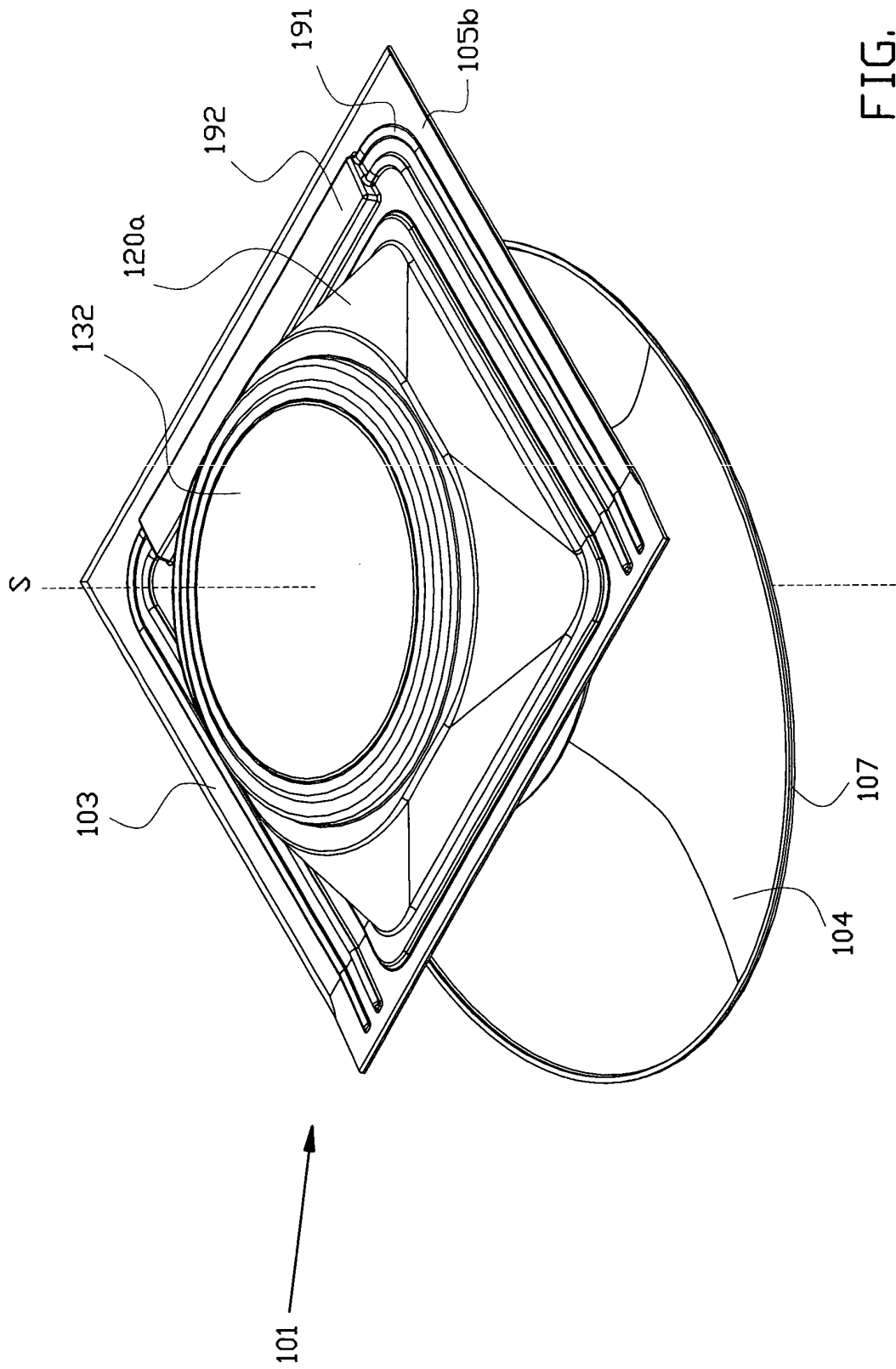


FIG. 6A

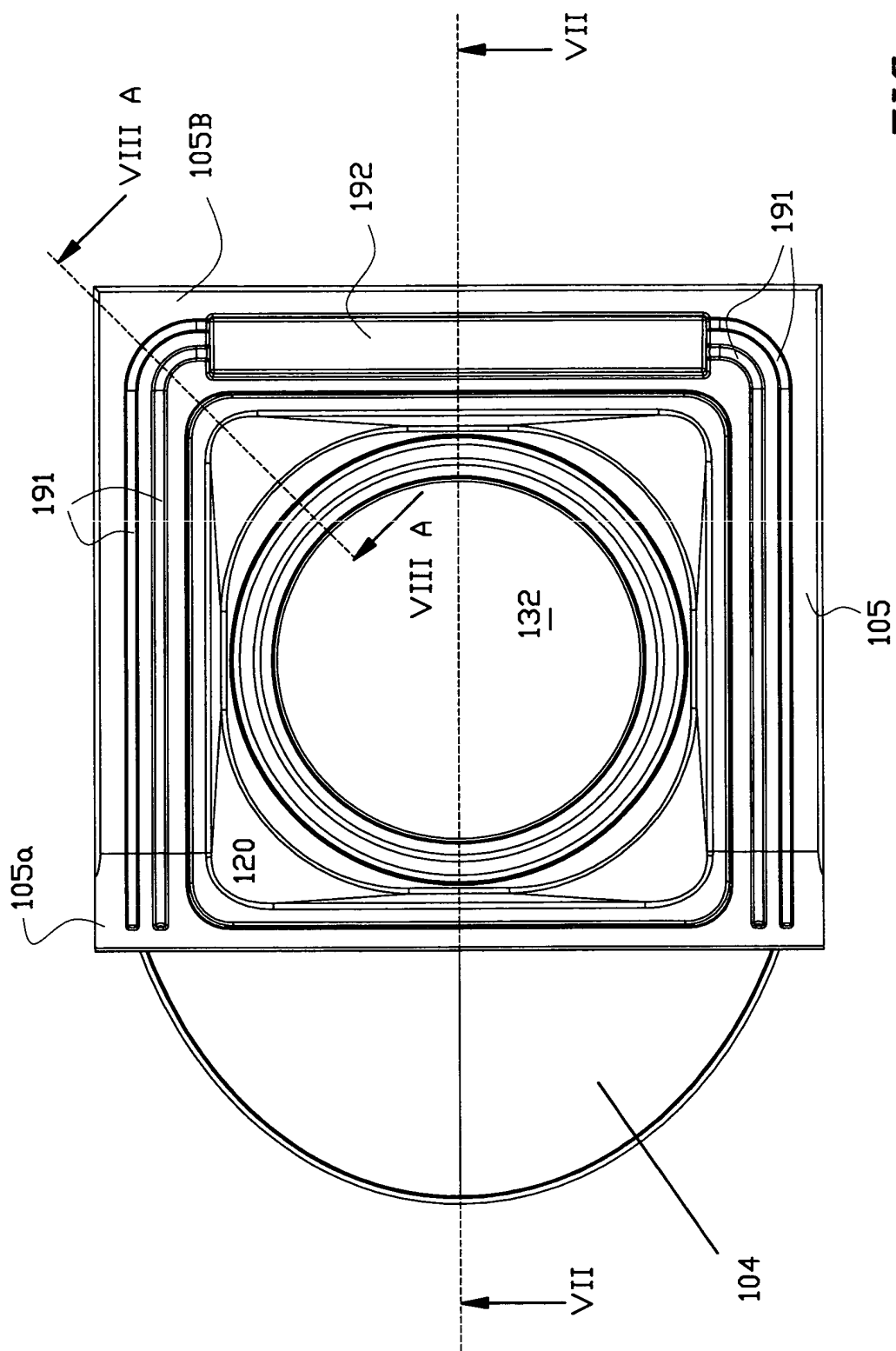


FIG. 6B

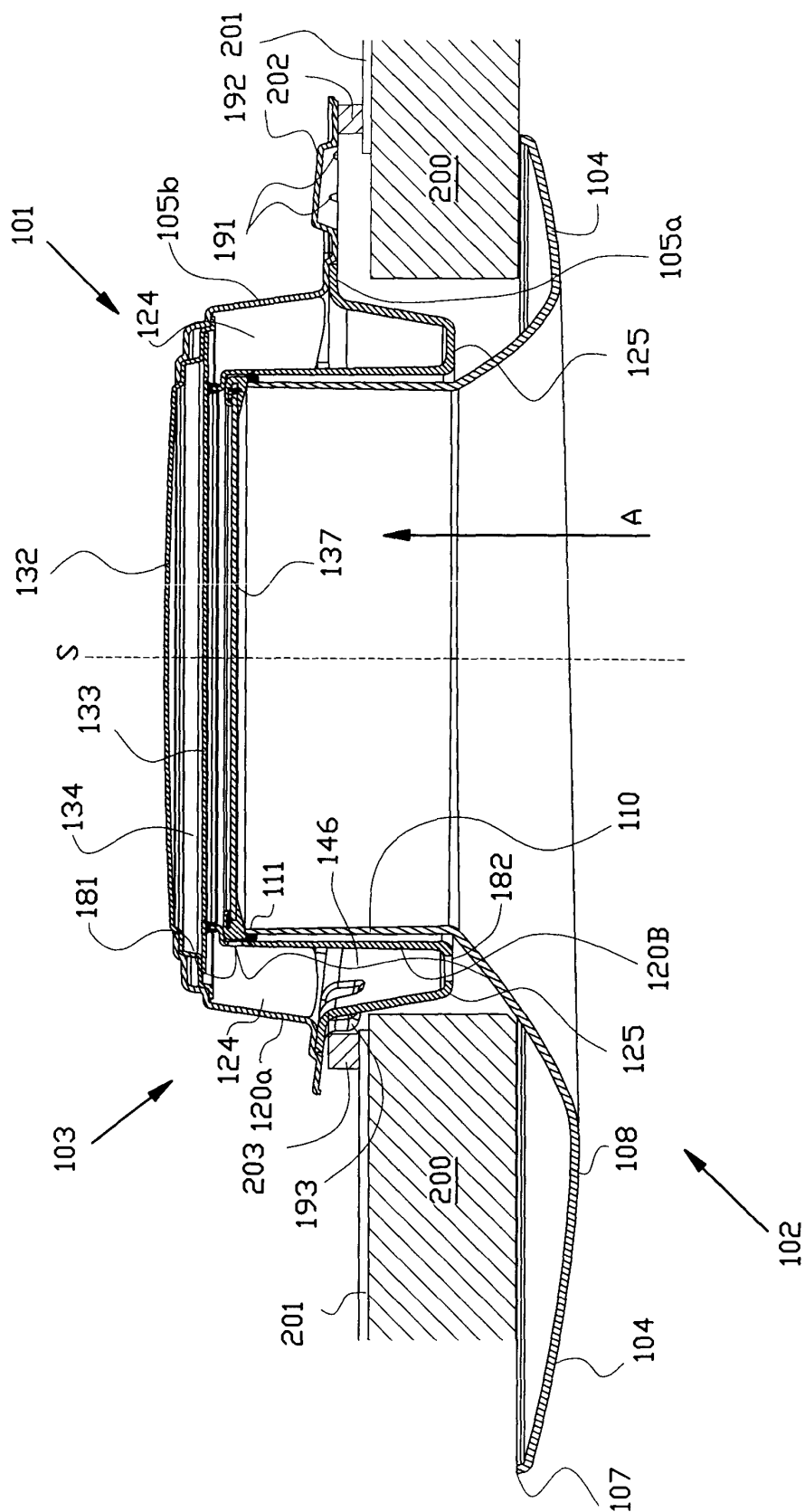
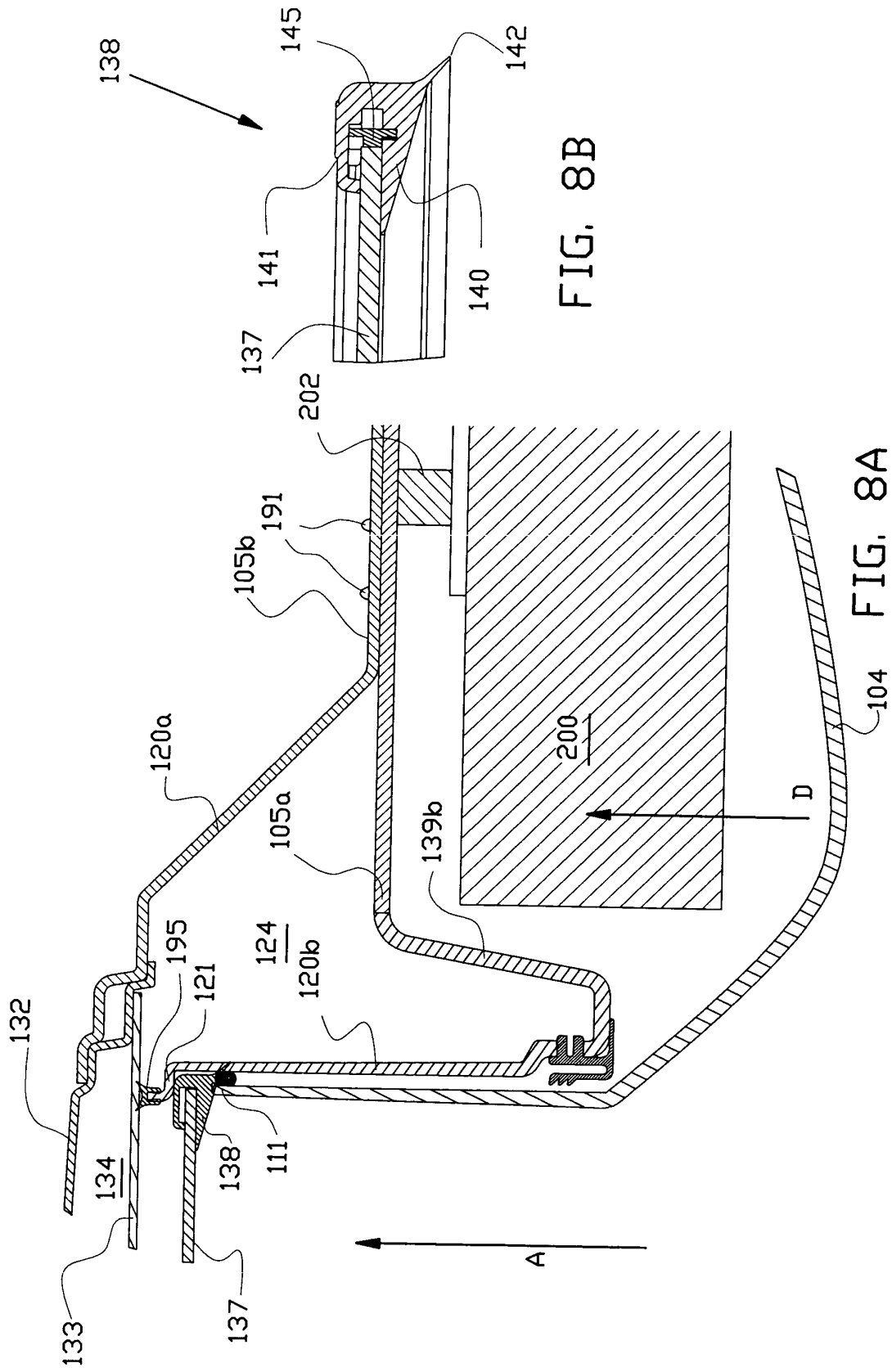


FIG. 7



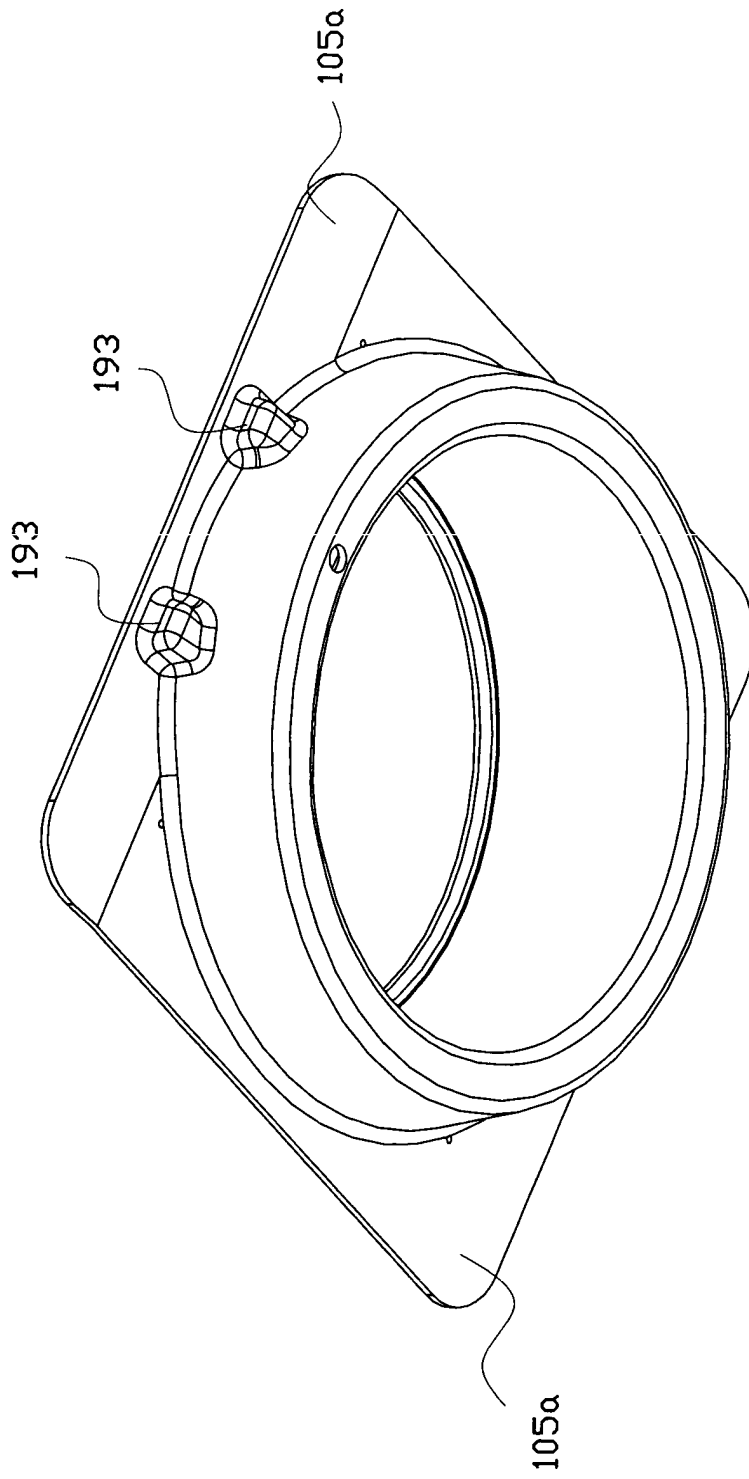


FIG. 9



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 05 07 5834

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